INDUSTRIAL HYGIENE SECTION

This Industrial Hygiene Section is published to promote sound thought upon and concerning industrial hygiene. To that end it will contain articles, discussions, news items, reports, digests, and other presentations, together with editorial comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

Industrial Medicine

Reg. U. S. Pat. Off.

The Editorial Committee will exercise its best judgment in selecting for publication the material which presents most exactly the factors affecting industrial health and developments for control of potentially injurious exposures. The editors may not concur in opinions expressed by the authors but will endeavor to assure authenticity of fact.

The Science, the Law and the Economics of Industrial Health

Volume 4 | January, 1943 | Section I

Hindering Hysteria

WITH many workers being engaged in industry for the first time and others in occupations with which they have not previously been familiar, there tends to be a feeling of over-apprehensiveness in regard to the new surroundings. In no phase of the new environment under which men and women find themselves is this more true than in regard to occupational disease exposures. Already in one large industry of great importance to the war effort a group of workers became so apprehensive over the possibility of injury to health due to materials necessary to the process that cessation of work was threatened.

In the past there have been a number of instances where hysteria has developed due to over-magnification of health hazards concerning which both the industry and the workers were not adequately informed. Among the circumstances which occasioned distorted viewpoints, owing to lack of accurate information over the past decade or two, may be mentioned excessive exposures to lead tetraethyl in its manufacture, benzol as used in the artificial leather industry, and silica dust in a much publicized tunneling operation.

It is well recognized that nerves become frayed under the pressure of war conditions. If we are to avoid hysteria among groups of people thrown into new occupation environments where they may smell obnoxious odors, see puffs of dust, or feel the irritation of caustic mist or gas on the eyes and nose, it is going to be necessary not only to keep exposures of such materials within safe limits but also to have specific knowledge as far as possible that such exposures are causing no injury to health.

Today there are a considerable number of services available through Federal, state and municipal bureaus, through insurance companies and through organizations and private consultants to provide just such information. Where industries are of sufficient size and present appreciable exposures, they should include, and to an increasing extent are including, trained industrial hygiene personnel.

By obtaining specific information on exposures to potentially injurious materials we have a potent means for preventing development of hysteria. In the first place adequate control as indicated by data on the extent of the exposure will go far in avoiding the development of cases of occupational disease; and in the second place the knowledge among employees that there is specific data showing conditions to be safe will be effective in reducing apprehension over the new surroundings.

There is no greater deterrent to efficient activity than an hysterical attitude toward the environment in which people find themselves. Employers should make ample provision that, so far as potential health hazards are concerned, they take adequate measures to avoid the possibility of development of hysteria due to such causes within their plants.

CONTENTS

OFFICIAL Publication of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, PHILIP DRINKER, Boston, President; H. H. SCHRENK, Pittsburgh, President-Elect; EDGAR C. BARNES, East Pittsburgh, Secretary; THEODORE F. HATCH, Philadelphia, Treasurer.

Published in January, April, July, and October of each year as the Industrial Hygiene Section of INDUSTRIAL MEDICINE.

Editor: WARREN A. COOK

Editorial Committee

H. H. SCHRENK, *Chairman*
C. W. MUEHLBERGER
A. D. BRANDT
W. R. BRADLEY
L. J. GOLDWATER, M.D.
MANFRED BOWDITCH
R. A. KEHOE, M.D.

Editorial Offices

605 North Michigan Ave., Chicago, Illinois.

Publisher

A. D. CLOUD, Publisher, *Industrial Medicine*

Donald E. Cummings

"God's Soldier Be He!"

AN AP dispatch from Fairfield, Utah, December 16, 1942, describing a Western Airlines transport crash that killed 17, continued: ". . . . the victims . . . . . DONALD E. CUMMINGS, 42, of Denver, head of the Industrial Hygiene Department of the University of Colorado."

Thus died an Officer of our Army of Production, who, except for others of the inscrutable ways of Providence, would now have been an Officer of our Army of War.

It was not generally known, even among the legion of his friends, that DON CUMMINGS was a West Point graduate, though his soldierly bearing bespoke the background. It was, however, universally known throughout his thousands of acquaintances that he was one of the really important men among the leaders in the science and the practice of industrial hygiene.

He was born at Blue Earth, Minnesota, in 1900. Completing high school there, he spent a year at a school in Alabama, preparatory for West Point. He was graduated from the U. S. Military Academy at West Point in 1920, as a Lieutenant. After about a year in the army, at Fort Knox, Kentucky, he resigned his commission to attend Massachusetts Institute of Technology, whence he emerged in 1923 with the degree of B.S. in chemical engineering. He continued in residence at M.I.T. as a member of the faculty during the succeeding summer course under Dr. Warren A. Lewis.

It was at this time that the condition developed which required him to go to the Trudeau Sanatorium at Saranac Lake, New York, where he was a patient for about a year before the condition became arrested. When he could be about, he taught physics and chemistry in the high school at Saranac Lake. Two years of this found him in better health, and he was able to take first-hand interest in the activities of the Saranac Laboratory for the Study of Tuberculosis, where Dr. LeRoy U. Gardner, its Director, was conducting experimental work on the effects of dust inhalation in connection with tuberculosis. In 1928 he became associated with Dr. Gardner in research on pneumoconiosis. Later he was made Assistant Director of the Laboratory, and throughout the remainder of his too short career he continued in this identification.

Characteristically, when he began to appreciate the diversity of Dr. Gardner's experimental work and the complexities involved in the results that were being sought, he made up his mind to become so familiar with every phase and feature of the whole business that he could not only understand what it was all about, but could also do every part of it himself. It is a matter of record, at least in Dr. Gardner's recognition, that he did just that. During the next half-dozen years he dug into all phases of the experimental work connected with silicosis and the interrelation between dust exposure and the development of tuberculosis. In the laboratory he developed a method for the separation of particulate matter smaller than screen sizes into graded fractions; this was incidental to the experiments being conducted, under Dr. Gardner's direction, on experimental pneumoconiosis. In the published reports of the laboratory studies he collaborated with Dr. Gardner in what is still the standard paper on the effect of inhalation of asbestos dusts upon primary tuberculous infection.

Recognition of his ability and the qualities of mind and heart that he put into his work brought him a series of assignments of progressive importance. The first one followed the closed conference on dust exposures held in Chicago in the autumn of 1932 under the auspices of the Wisconsin Industrial Commission. This assignment involved an investigation of the dust exposures in the mining operations of a large company in northern Wisconsin, to ascertain the extent of the dust hazards and develop methods of silicosis prevention. He moved into the mine area and, for the several months which the work required, he spent a great deal of his time underground, mastering every detail of the work. The result was that he installed a ventilation program which is still as well liked by all concerned—executives, medical men, superintendents and workers—as it was well received by all of them when it was first put in.

From this job he was called to others, mostly in mining; and gradually he begun to feel that he knew something about the prevention of silicosis. At a meeting of the Lake Superior Iron Ore Association in 1933, he presented the advantages of a comprehensive program for silicosis prevention, and did it so well that he was prevailed upon to become Director of the Saranac Field Service in charge of the work in the Lake Superior region, where he resided at Ironwood, Michigan, through 1934 and 1935. His vivid approach to the whole problem of silicosis is well illustrated by his discussion of the administrative aspects, at the third Saranac Lake symposium.

Dust is only one hazard, and in studying it he became familiar with others. Each was a challenge, and he made it his business to learn everything there was to be known about them and the means of their prevention and control. His mind could not suspend inquiring as to any of them until the last question was answered as to all of them. And so thorough were his studies that he became an authority on many matters of occupational health significance. As an ex-

ample, he got to know manganese poisoning as well as he knew silicosis—and that meant he knew it very well indeed. From his often demonstrated ability to talk to physicians in their own language on the medical and x-ray evidences of silicosis, he went rapidly to an ability of conviction on employee health in general, to which he gave voice among presidents and board of directors. And, naturally enough, he was soon occupied in organizing occupational disease control and industrial health programs for manufacturing as well as mining industries; the transition from extracting ore to handling metal meant progress from hazards of one kind to those of another kind. Among the next of his important assignments was the engagement to install an occupational disease control and employee health program for one of the large steel companies in the Chicago area. In this behalf he was consultant; and almost immediately thereafter his reputation as a consultant had become national—and, more, continental.

Too much of his brain and body, however, were going into his work; in 1936 his tuberculous condition became activated, and he moved to Denver to recuperate. For a year or so then, his bedside was piled high with letters and documents relating to his consultations and the direction of projects begun under his charge.

Once again able to go about, he resumed his consulting work on an ever-expanding scale, particularly among the large mining concerns in the Rocky Mountain area. In 1938 he organized an industrial hygiene course and was appointed Director of the Department of Industrial Hygiene of the Medical School of the University of Colorado. At Dr. Gardner's request, he continued as Director of the Saranac Field Service, but limited his interest in this regard largely to the work with the Lake Superior Iron Ore Association.

He was active in the organization of the four Saranac Lake symposiums on silicosis in 1934, '35, '37, '39 and presented papers at each. At the 1941 Saranac symposium on tuberculosis in industry he discussed the subject so comprehensively that his analysis was published by the International Labor Office in their work, "Occupation and Health."

At the time of his death he was using the method of travel so frequently necessary for him over the past years; the operations he was directing were widely scattered. He had been consulted on the possibility of excessive exposure to manganese ore dust in the huge mining operations in the vicinity of Las Vegas, Nevada; he was engaged in setting up an engineering and medical program so that this development, extremely important in the present war effort, would not be set back by occupational diseases among the workers.

One of the pioneers in the organization of the American Industrial Hygiene Association, he was made president-elect in 1940 and succeeded to the presidency the following year. In his consulting capacity he was connected with the U. S. Public Health Service under Dr. Leake. His memberships included the National Tuberculosis Association, and the American Chemical Society; he was also among the members of a special committee of the American Society for Testing Materials.

Although not a prolific writer, his dozen or so of published papers are notable for thoroughness of concept and studiousness of preparation.

He is survived by his widow, Helen Clark Cummings, a daughter Cynthia, 14, and a son John, 12.

He was taken from the midst of his work, but his place in the history and development of industrial hygiene is nevertheless as prominent and secure as if he had been longer spared. The future could have added only more, not brighter, luster. Carrying on in spite of handicaps that would have floored a lesser man, he made the best of all his qualities and abilities; every one of the multitude who will miss him and long remember will agree that "best" for him meant only *superlative*. Honest, forthright, kindly, he was preeminent in the place he had made for himself—a good soldier, in the uniform of his own fine capabilities.

Lead Symposium

—Journal of Industrial Hygiene and Toxicology, February, 1943—

A NOTABLE feature of the meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS and the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION held at Cincinnati in April, 1942, was the symposium on lead poisoning. In addition to the usual abstracts, the February, 1943, issue of the *Journal of Industrial Hygiene and Toxiology* will contain all six of the papers presented at this symposium. No other articles will be published in this issue. The editors believe this symposium will make an important monograph, and they request that anyone interested in securing a copy of the February issue (Vol. 25, No. 2, February, 1943) write in advance to Williams and Wilkins, Inc., Mt. Royal and Guilford Avenues., Baltimore, Maryland. The price will be the usual cost of the current issues of the *Journal*, namely 75 cents, postpaid.

The papers and authors are as follows:

"The Measurement of Industrial Lead Exposures by Air Analysis," by JOHN BUXELL, Health Division of the Department of Public Welfare, of the City of St. Louis.

"Measurement of Industrial Lead Exposure by Determination of Stippling of the Erythrocytes," by LESTER W. SANDERS, Kettering Laboratory of Applied Physiology, College of Medicine, University of Cincinnati.

"Measurement of Industrial Lead Exposure by Analysis of Blood and Excreta of Workmen," by JACOB CHOLAK and KARL BAMBACH, Kettering Laboratory, University of Cincinnati.

"Industrial Lead Poisoning as a Clinical Syndrome," by WILLIAM F. ASHE, Kettering Laboratory, University of Cincinnati.

"Health of Lead-exposed Storage Battery Workers," by W. C. DREESSEN, U. S. Public Health Service.

"Experimental Studies on Lead Absorption and Excretion and their Relation to the Diagnosis and Treatment of Lead Poisoning," by ROBERT A. KEHOE, JACOB CHOLAK, DONALD M. HUBBARD, KARL BAMBACH and ROBERT R. MCNARY, Kettering Laboratory, University of Cincinnati.

Acute and Chronic Toxicity

—Public Health Aspects—

GEOFFREY WOODARD and HERBERT O. CALVERY, PH.D.,
Food and Drug Administration,
Federal Security Agency, Washington, D. C.

AS OUR population becomes more urban and our consumption of synthetic materials grows with each year, the problem of acute and chronic toxicity becomes increasingly important to the public health. Such concentration of population necessitates handling, transportation, and storage of foodstuffs. This in turn has resulted in the use of preservatives and stabilizers, and in the danger of contamination of foods in manufacturing, refining, and packaging. The exposure of the

---

Read before the American Public Health Association at the Seventieth Annual Meeting in Atlantic City, October 16, 1941.

majority of the population to ever-increasing quantities of synthetic products in foods, drugs, cosmetics, household items, clothing, etc., extends the possibility of chemical sensitizations and poisonings. Urban areas require central water supplies which must be so chosen and maintained that they will not contain harmful impurities. The exposure of hundreds of thousands of industrial workers to toxic substances is another important factor in the public health. This is especially true in the present emergency. There is the danger that the industrial hazards of rapidly developing new processes and longer hours of exposure have not yet been fully appreciated. In addition, the spraying of fruits and vegetables for insect control has given rise to the spray residue problem. These are some of the problems that face public health officials in a modern civilization.

In order to control these possible sources of poisons, it is necessary for public health officials to evaluate all specific and related information so as to determine the quantitative amounts which may be detrimental to the public health, and if necessary, establish tolerances and regulations. The question then arises how best to arrive at such conclusions. A vast literature has grown up in regard to the older recognized poisons so that a large part of the work would be in the evaluation of the literature. However, with the newer substances, or even with the older substances which have not been properly investigated, it will be necessary to design and carry out well-controlled toxicological investigations, and when the studies are complete, make proper evaluations of the data obtained. The following general plan of procedure is suggested:

A. Pharmacodynamics
   Blood pressure; respiration; heart rate; organ perfusion; isolated tissue preparations; etc.
B. Acute toxicity
   Dosage response curves on three or more species; objective symptoms; statistical calculations for comparative studies; simultaneous comparative determinations of other substances.
C. Subacute toxicity
   Large daily doses to one or more species for six to 12 weeks; microscopic pathology.
D. Chronic toxicity
   Three or more species; at least one species for the life of the animal; several dosage levels graduated to produce from no effect up to marked lesions, and possibly shortening life span; microscopic pathology.
E. External effects
   Sensitization; skin irritation; mucous membrane irritation.
F. Special studies
   Reproduction; hematology; absorption and excretion; distribution and storage; effect of diet.

This plan is obviously rather general and incomplete, but it can be changed to fit the individual case. For clarification, the following discussion and examples are presented.

A study of the pharmacodynamics of a substance often gives considerable useful information and usually provides one with preliminary data for further work. Effects on blood pressure, heart rate, respiration, nerve reflexes, smooth muscle motility, etc., can be advantageously observed on dogs, rabbits, or cats. The effect on isolated organs or tissues may also yield a good deal of information.

After the pharmacodynamic investigation is under way, the next most useful step is a determination of the acute toxicity of the material and the objective symptoms produced. For this purpose, the acute oral, intraperitoneal, intravenous, or subcutaneous dose should be determined on at least three species. The rat, mouse, and guinea pig are well suited for this, since these animals have been quite well standardized. Some investigators prefer to use, in addition, rabbits and cats. In any event, sufficient animals at a number of different dosage levels should be used so that it will be possible to calculate the dose that will kill a given percentage of the animals. The dose that will kill 50% (LD 50) is the one usually determined, since it can be most accurately estimated.[1] The steepness of the dosage response curve and the probable error of the determination should also be calculated. These data will then enable one to compare his results with those reported in the literature.

For certain substances which may act through inhalation or skin absorption, the method of procedure for acute toxicity determination should be altered so as to make the experiment applicable to actual experience.

It has been found in our laboratory that the determination of the sub-acute toxicity yields a great deal of information in a relatively short period of time. This determination also serves as a guide in the design of chronic experiments. In this type of investigation, rather large quantities of material are fed or injected daily to one or two species of animals, preferably rats, or rats and one other species such as dogs, monkeys or guinea pigs. The experiment is continued six to 12 weeks, at which time the animal is sacrificed and gross and microscopic pathology are observed. The dosage should have been high enough to produce a rather marked effect.

In this same category we include experiments on the effect upon the growth. Animals at weaning age (21-day-old rats) are carefully chosen and placed on experiment in such a manner that there are adequate controls. The substance can be given in the diet, be injected, or be given in any applicable manner. These experiments continue for at least 12 weeks, at which time the period of maximum rate of growth has been passed.

With the above information, we can now more intelligently plan a chronic experiment. As a matter of fact, if the subacute experiments have been properly started, they may in some cases simply be extended to cover a longer period of time. In any event, the experiment should be conducted on three or more species for the lifetime of at least one of them. Rats, dogs, mice, and monkeys are usually good chronic toxicity subjects. Since the life span of a rat is relatively short—two to three years— and since the rat has been well standardized in many laboratories, this animal is probably the best in every respect for lifetime chronic studies. In such experiments it is well to use several dosage levels of equal gradation from the dose sufficiently high to cause marked lesions, possibly shortening the life span of the animal, to a dose sufficiently low that there are no observable differences between the experimental and control animals.

The value of such long term investigations is well illustrated in the results obtained by Yoshida[2] who fed orthoaminoazotoluene to rats for 200-300 days to produce true experimental liver tumors. It has also been well illustrated in our own laboratory by studies on the glycols.[3] Ethylene glycol, for example, was fed in the diet of rats at levels of 1% and 2%. Kidney and bladder stones appeared in both series of animals. No stones were observed, however, in animals that failed to survive longer than 15 months. Another example is the production of neurofibromas on the ears of rats fed crude ergot.[4] These tumors first appeared after about 12 months and within 24 months were present on all animals receiving 5% of ergot in the diet. There

are many other examples, especially in the study of lead, arsenic, fluorine, selenium, and cadmium, where the long term experiment has yielded otherwise unavailable information. In all of these chronic experiments, it is obviously important that pathological studies be made.

Since a number of substances may exert their toxic effect by single or continued contact with the skin, an important part of every toxicological investigation is a study of the sensitization and irritant properties of the material in question. Guinea pigs have been extensively used for sensitization tests as described by Landsteiner.[5] Comparative investigations of other species have revealed that the white male guinea pig weighing 300-400 grams is by far the most consistent and dependable test animal for obtaining comparable results in sensitization studies. Skin irritation tests on rabbits or some other suitable animal should be performed. It is the consensus of opinion of investigators of skin irritants that the albino rabbit is the animal of choice when primary irritation of the skin is the question involved, since the results of tests made on these animals correspond more closely to the effects produced on man than the results obtained on any other species. Here the procedure may be the obvious one of application and observation, or it may involve other determinations such as the effect of the substance on the pH of the skin. Another test often used for irritant properties is the instillation of the substance in the conjunctival sac of the eye of the rabbit or some other animal.

In addition to the above experiments, which should be carried out for each substance studied, there are several special studies which should be done whenever they are at all applicable. It is in these special studies that one may often find the clue to the preventive measures which can be taken to avoid some of the results of the toxic actions of a particular substance. Reproduction studies are really a part of the chronic toxicity experiments and should yield information as to whether the substance in question will affect fertility, lactation, size of litters, and mortality of the young. Hematological observations are often of considerable value in conjunction with the long term chronic experiments. The presence of anemia, leucopenia, nucleated red cells, etc., is usually an indication of toxicity which may appear before there are other obvious signs. Moreover these observations often lead to the development of valuable diagnostic methods for the detection of specific toxic effects.

The absorption, excretion, distribution, and storage of a toxic agent will often guide one in an estimation of its probable effect. If there is an indication of storage of the toxic substance, one should watch for cumulative toxicity. If the material is rapidly eliminated from the animal, and no storage occurs, the toxicity from cumulation likely will not be as serious as the chronic toxicity which may result from the passage of the poison through the system. Some minerals, because of their low solubility in the gastro-intestinal tract and consequent poor absorption, constitute a less serious problem when ingested than when they are present as contaminants of the air. Of these, silicon dioxide is an excellent example. The rapid elimination of many of the coal-tar colors used in foods and drugs may account for the low toxicity of these compounds. The relative concentration of a poison in the tissues and organs of the body may sometimes indicate the most likely focus of toxic action. Mercury, for example, is found in the highest quantity in the kidney, which organ is the one most severely affected in mercury poisoning.

The effect of diet on the toxicity of poisons has been a subject of considerable investigation in recent years and there are several instances where relative toxicity has been related to the components of the diet. For example, high protein diets partially protect against the toxic action of selenium,[6] dimethylaminoazobenzene[7] and other compounds. A high calcium diet influences the rate of storage and toxicity of lead.[8] Further, it has been found in this laboratory that guinea pigs on a diet low in vitamin C are more susceptible to compounds such as the gycols and mercury salts.

If, instead of testing only one substance, a series of similar substances can be studied simultaneously, a great deal more information obviously can be obtained. When a number of substances are tested at once, a larger group of animals will necessarily be used and thus provide a better background for evaluating any one poison. Moreover, it often happens that the substance can be tested alongside a substance whose toxicity for man is known, and such comparative information is valuable.

Extensive investigations carried out on different species of animals are to our minds absolutely essential before a substance should be introduced into the economy of man. The experience and information thus obtained will then enable one to interpret observations made on human beings whether accidentally or industrially exposed to such a substance, or whether intentionally exposed under carefully controlled clinical conditions.

Interpretation of Toxicity Data

AFTER the toxicological data have been made available, the next major problem which presents itself is the interpretation of these data in terms of their applicability to the public health. The factors involved in making such an interpretation are numerous and complicated. In order that they may be more easily visualized, it seems advisable to present some of them in outline form, followed by a brief general discussion:

A. Variation between species
   1. Response of different species to a single substance.
   2. Response of different species to different substances. Contributory factors to the above differences in response are relative surface area and organ capacity, and differences in absorption, metabolism, detoxification, and excretion.

B. Variation between individuals in the same species
   1. Normal distribution and heterogeneity of the population.
   2. Physiological condition.
      (a) Age, sex, weight.
      (b) External environment.
      (c) State of physical exertion.
      (d) Pregnancy and lactation.
      (e) Presence of food in gastro-intestinal tract.
   3. Pathological condition.
      (a) Renal, cardiac, and hepatic insufficiency, etc.
      (b) Presence of infectious organisms.
      (c) Nutritional deficiencies.
   4. Multiple exposures.

Without pausing to reflect, one may be unaware that there are wide variations among species in their response to individual toxic agents. Moreover, it may not occur to many that man is more susceptible to the majority of toxic substances than is any other species. The variation in species response is illustrated by the acute toxicity of copper and mercury. Guinea pigs are very susceptible to these substances while rats and mice are relatively resistant. On the other hand, some experiments in our laboratory indicate that guinea pigs are more resistant to some of the organic amines

than are rats and mice. Such differences, then, must be considered for each substance studied. If careful toxicological experiments have been done on several species, and especially if comparative studies with known poisons have been carried out, a simple correlation should point the way for estimating the probable level tolerated by man. Direct translation from lower animals to man in terms of milligrams per kilogram of body weight is rarely possible and sometimes ludicrous. For example the rat can tolerate 100 milligrams of lead per kilogram per day for at least a year and survive, which in terms of a 70-kilogram man would mean 7000 milligrams per day. This is, in the minds of some investigators at least, 5000 times the amount that could be tolerated. Variability among species is further illustrated by the acute toxicity of diethylene gycol.[9, 10] As our toxicological data increase, more of these intercomparisons are made possible, and the more certain we can be of our judgment.

Species differences are undoubtedly a reflection of differences in physiology. The ratio of body weight to surface area, relative size of organs, vital capacity, etc., vary from species to species. In the metabolic processes and detoxification mechanisms there are likewise recognized differences.

Although investigators usually recognize and take into account variations among species, it sometimes happens that they do not as seriously consider the wide variations that occur among individuals of the same species. Even when they do recognize that there is individual variation, they do not recognize that it is the rule and not the exception—that in fact it is a normal biological phenomenon. There is a normal distribution in reactions to poisons just as there is a normal distribution in weights and heights of men and women. And just as there are a few very tall and a few very short persons, just so will there be a few very susceptible and a few very resistant persons to a given poison. Unless the investigator considers this, he may not allow for the extremes in the population. It is easy to demonstrate such a normal distribution in animals, and the slope of the dosage response curve is a reflection of the manner of this distribution. Some poisons for example, will give a graded response over a wide range of concentrations, while other poisons will give a graded response over only a very narrow range of concentrations. The human population is quite variable so that the graded response to most poisons will be over a wide range of concentrations. In applying animal toxicity data then, we must allow for a probable flattening of the dosage response curve for man, because of the fact that experimental animal colonies show less variability in the response to poisons.

The age, sex, and weight of the individual may have an influence on the toxicity of the poison. The size effect in guinea pigs treated with glycols has been reported.[9] The clinician has taken cognizance of the variation with age in prescribing separate doses for children and adults. Variations due to sex are most marked during pregnancy and lactation. The environmental temperature has an effect on the response to the action of some substances as has been demonstrated on rats for morphine, paraldehyde and pentobarbital sodium.[11] Physical exercise may directly and certainly can indirectly affect the results of exposure to a toxic agent. It is obvious that during strenuous physical exertion, one will breathe more air and in that way become exposed to more of an air contaminant. At the same time, the flushing of the skin in exercise may permit greater skin absorption of toxic agents. Moreover, the individual doing heavy physical work will eat more, and drink more than the sedentary worker and thus be exposed to greater quantities of a possible toxic agent. A large number of other conditions which might affect the toxicity of a substance undoubtedly exist.

The state of nutrition can easily influence the results of a toxicological investigation. For example it has been demonstrated that soluble tin salts exert an extremely irritant action on the empty gastrointestinal tract, whereas they show very little effect in the presence of food. Similar results have been obtained repeatedly in our own laboratory with other toxic substances. The lack of agreement between different laboratories investigating the same substance can often be explained by differences in the state of nutrition of the animals used in the experiment.

So far, we have discussed reactions on normal individuals. Our experiments have been carried out using normal healthy animals. But in the public which may be exposed, there are many who are most certainly not normal, healthy persons. We must consider then a rather large number of persons who are so unfortunate as to suffer from pathological conditions or disease. The yearly vital statistics are ample proof of the number of people who have cardiac, renal, or hepatic insufficiencies or cancer. Others may have anemia, respiratory infections and so on. Medical research is constantly striving to improve the health of this portion of the population and it would therefore seem that it is the duty of the toxicologist and the public official to take cognizance of those chronic poisons whose actions are specific for certain organs and tissues, and may be potentiated by such pathological conditions.

There are large areas in which the daily dietary is poor. Among the lower income classes, there may be insufficient funds to provide an adequate diet. Even in the well-to-do families, there are those who follow diet fads with a consequent failure to get a well balanced diet. The effect of the dietary on toxicity of poisons has already been discussed in the section on design of experiment, so all that need be said here is that there seems to be no reason why the experimental findings should not have a very practical application. In the relation of diet to toxicology it would seem that there is much room for preventive measures wherever there is unavoidable exposure to toxic agents.

In studying a toxic agent, one is likely to be considering only his own particular problem. However, he should not forget that the public is exposed to other poisons every day. There is the possibility that some of these poisons may have an additive or summation effect. Therefore, it becomes necessary to consider all possible sources of poisoning at the same time, in order to come to a judicious conclusion.

Summary

INCREASED exposure to toxic substances is a consequence of modern civilization. In order better to understand the problems of acute and chronic toxicity resulting from such exposures, well controlled toxicological investigations must be carried out. It is essential in these experiments that the levels causing acute, subacute, and chronic toxicity be accurately determined on several species of animals. Chronic studies must extend for the lifetime of the animal. Since the results of these experiments on animals are to be interpreted in terms of man, and since the tests are made upon normal animals under ideal conditions, all factors related to species variation and individual variation must be kept in mind when evaluating toxicity data in formulating tolerances or regulations for the protection of the public health.

References

1. BLISS, C. I.: The Determination of the Dosage-Mortality Curve from Small Numbers. *Quart J. Pharm. & Pharmacol.*, 11: 192, (April-June) 1938.

2. YOSHIDA, T.: Über die nebensächlich beobachteten Harnblasenepitheliome der mit o-Amidoazotoluol gefütterten Hepatomratten. *Gann*, 29: 295, 1935.

3. MORRIS, H. J., and CALVERY, H. O.: Chronic Toxicity of Some Glycols. Unpublished data from the Division of Pharmacology, Food and Drug Administration, Washington, D. C.

4. NELSON, A. A., FITZHUGH, O. G., and MORRIS, H. J.: Neurofibromatous Tumors of the Ears of Rats Produced by Prolonged Feeding of Crude Ergot. *Am. J. Pathology*, 624: (July) 1941. (Abstract).

5. LANDSTEINER, K., and JACOBS, J.: Studies on the Sensitization of animals with Simple Chemical Compounds. *J. Exper. Med.*, 61: 643 (May) 1935; 64: 625 (October) 1936; 64: 717 (November) 1936; 66: 337, (August) 1937.

6. LEWIS, H. B., SHULTZ, I., and GORTNER, R. A.: Dietary Protein and Toxicity of Sodium Selenite in the White Rat. *J. Pharmacol. & Exper. Therap.*, 68: 292, (February) 1940.

7. WHITE, J.: Retardation of Growth of Rat Ingesting p-dimethylaminoazobenzene (Butter Yellow). I. The Effects of Various Dietary Supplements. *J. Natl. Cancer Inst.*, 1: 337, (December) 1940.

8. CALVERY, H. O.: Chronic Effects of Ingested Lead and Arsenic. *J.A.M.A.*, 111: 1722, (November 5) 1938.

9. LAUG, E. P., CALVERY, H. O., MORRIS, H. J., and WOODARD, G.: The Toxicology of Some Glycols and Derivatives. *J. Ind. Hyg. & Toxicol.*, 21: 173, (May) 1939.

10. CALVERY, H. O., and KLUMPP, T. G.: The Toxicity for Human Beings of Diethylene Glycol with Sulfanilamide. *South. Med. J.*, 32: 1105, (November) 1939.

11. HERRMANN, J. B.: Effects of Certain Drugs on Temperature Regulation, and Changes in their Toxicity, in Rats Exposed to Cold. *J. Pharmacol. & Exper. Therap.*, 72: 130, (June) 1941.

Hygienic Disposal of Collected Dry Dusts

C. A. SNYDER,
Supervising Engineer, Dust Collector and Air Blast Equipment, American Foundry Equipment Company, Mishawaka, Indiana

IT IS generally agreed that the most efficient dust collector for fine dry dusts is a cloth filter type collector, either the tubular or envelope type. However, one of the most serious objections to dry collection is the possibility of recirculation of part of the collected dust while unloading the collector hoppers.

In the past, the usual practice was to unload dust hoppers when there was a minimum number of workers in the plant. However, this is not always possible at the present time when a majority of plants are working round the clock shifts.

The simplest method of minimizing dust dispersal is to install flexible spouts, usually canvas, on the bottom of the hopper valves. These should extend well below the top of the dust receptacle. By allowing the spout to first fill with dust and then by carefully raising and lowering the spout with the lower end touching the dust pile or bottom of the container, many operators are able to empty hoppers with very little dust dispersed.

Many dry collectors are equipped with enclosures around the base of the unit. This prevents the circulating air currents from picking up any float dust created in unloading.

The use of a screw conveyor to connect all hoppers and bring the dust to a single discharge point is to be recommended in some cases. The addition of an air lock valve to the conveyor allows discharge of the dust while the exhaust fan is operating.

There are many designs of sealed top containers which are flexibly connected to hopper spouts. In some cases, provisions are made for exhausting the container while the air is being displaced by the falling dust. However, these systems are most easily applied to small installations or where the quantity of dust is small and can be handled readily in a portable steel barrel.

All these devices control the dust disposal into portable containers to a varying degree, but most dusts have to be transported from the collectors to a dumping ground which might be several miles from the plant. During transportation, it is quite probable that a considerable amount of the dust will be blown out of the truck by the wind or spilled out of the truck by the vibration of driving. This condition will eventually result in complaints from residents and might even bring restraining orders from municipal governments.

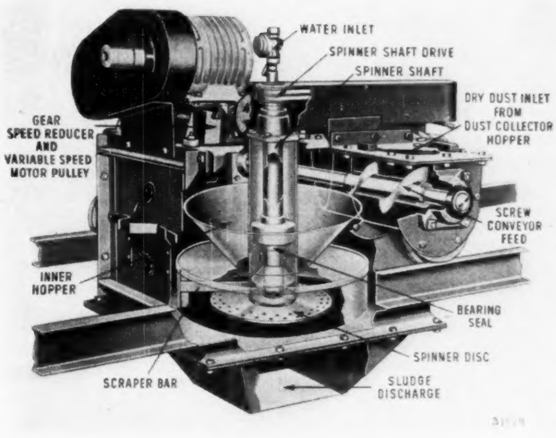

Fig. 1
Mechanism of wet dust disposal unit

The wet disposal of dry dusts offers the advantages claimed for wet dust collectors without any of the ordinary operating troubles of these units, and together with a filter type collector provides the most efficient dust collecting system for dry materials.

Fig. 1 shows the wet disposal unit built by the American Foundry Equipment Company.

The dry dust flows by gravity from the collector

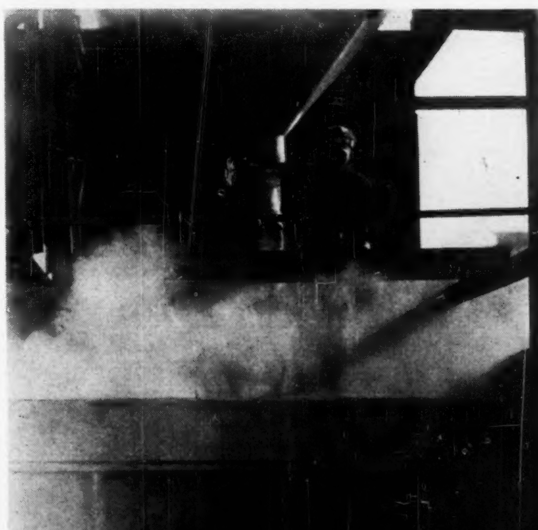

Fig. 2
Dust cloud resulting from discharge of hopper with no dust control measures

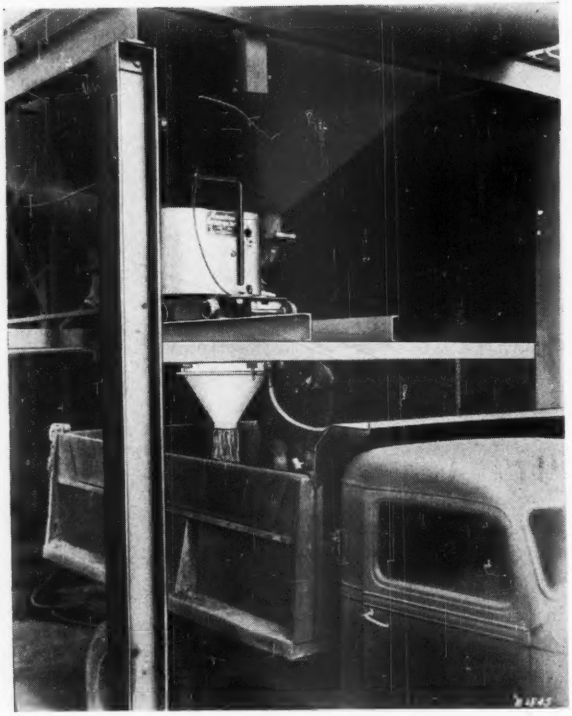

Fig. 3
Discharge of dust from hoppers through wet disposal unit

hopper through a flexible coupling into the built-in screw conveyor feeder of the disposal unit. The dust is carried by the conveyor at a uniform rate of feed to an inner hopper within the housing of the unit.

Water is fed through the hollow rotating spinner shaft and is thrown outward by centrifugal force through the space between the shaft end and the high speed mixing (spinner) disc.

At the same time, the dust is flowing from the inner hopper by gravity, and falling on the spinner disc through the annular opening between the hopper bottom and the central bearing tube.

The impact of water and dust on the high speed spinner disc results in an instantaneous mixture or sludge.

The consistency of the mixture can be varied by means of a variable speed drive for the screw conveyor, and a lever operated water valve.

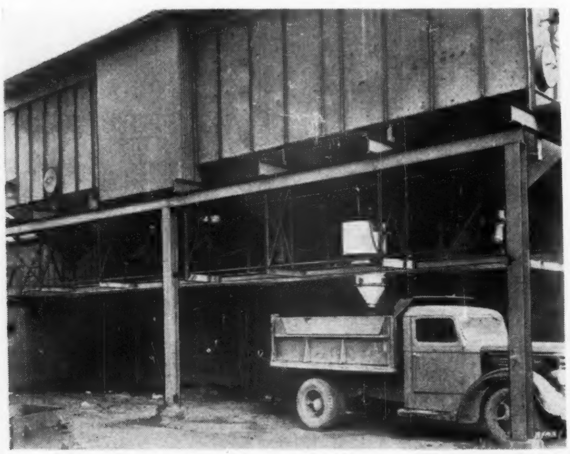

Fig. 4
Disposal of dust as wet sludge from collector hopper

Ordinarily, the wet disposal unit is mounted on wheels and can be moved on a track to any station of a multiple hopper collector. This, of course, requires flexible electrical cable to the motors and a rubber hose for the water supply.

Many units are equipped with an auxiliary screw conveyor serving all hoppers, allowing the disposal unit to be mounted permanently in one position for remote control from ground level.

The amount of dust which can be handled by the wet disposal unit depends upon the type, size, and specific gravity of the dust; also upon the desired consistency of the mixture. Sand dust is handled most readily; some installations mixing as much as 5 cubic feet per minute.

If a very dry mix is desired, without any free water apparent to the eye, there will be a slight noticeable amount of dry dust escaping the unit; less than 1% of the material handled. If 100% suppression is required, it will be necessary to run a thinner mix which might require water-tight containers.

As the unit is not a batch type mixer, allowance must be made for an excess of water at the start of operations until the dust is flowing steadily, and for flushing out the unit after operation. This excess water is absorbed by the dust load in a very short time.

The wet disposal unit can be operated outdoors during freezing weather, unless the temperature drops to about +10° F. Provisions must be made for a drain cock inside the building wall, and a rubber hose with quick couplings for easy return of the water line to the inside of the building.

Where dust collectors are located inside manufacturing buildings it is especially important to provide some means of avoiding dissemination of dust as it is removed from the hoppers under the collectors. Even where the collectors are located outside, the worker discharging the dust from the hoppers is exposed to a heavy dust exposure as shown in Fig. 2 unless control measures are instituted. The elimination of dust during this operation by means of the wet disposal unit is well illustrated in Figs. 3 and 4.

Industrial Hygiene Meetings

—Abstracts of Papers of the Industrial Hygiene Section Meetings of the Seventy-First Annual Meeting of the American Public Health Association, St. Louis, October 26-30, 1942—

Reported by

C. O. SAPPINGTON, M.D., DR. P. H.

THE attendance at the industrial hygiene meetings at the St. Louis Convention of the American Public Health Association reached an all-time high in the 27 years' existence of the Industrial Hygiene Section. Likewise, there was much enthusiasm in the discussions, and a comprehensive program covering many different types of interests.

Starting on Monday with a Symposium "Industrial Health Work Pays," there followed on Tuesday a Symposium on "Industrial Hygiene and the War," a Symposium on "Training of Industrial Hygiene Personnel" on Wednesday, and also on the same day the usual Industrial Hygiene Section luncheon with reports of the various committees; on Thursday a Symposium on "Chemical and Engineering Methods in Industrial Hygiene," with an afternoon meeting devoted to miscellaneous subjects; closing on Friday with a joint meeting with the Food and Nutrition Section.

Monday Afternoon

MR. W. SCOTT JOHNSON, the first speaker in the Symposium on "Industrial Health Work Pays," discussed the subject "How Does Health Pay?"

Now that there is more work than workers, health is of greater importance and more vital to production.

What is the tangible value of keeping well? Assuming 10 days absenteeism on the average, if a 10% reduction was accomplished, some 70 million days might be saved, possibly turning the tide in our favor in the war effort.

The health program should be responsible for all loss factors and is really a program of adult hygiene.

We have to consider of course, that medical care has been greatly curtailed in most districts on account of the war needs, and therefore, the necessity for the correlation of community health services.

There is an example in the State of Missouri, in which the State Health Department, assisted by local field agencies, was able to provide two metropolitan programs in Kansas City and St. Louis. These programs stress the following: (1) advisory service to plant management on hazards; (2) a system of records and analysis; (3) the encouragement of medical services; (4) stimulating the interest of physicians and nurses; and (5) the planning of local services.

MR. E. E. NEFF, a representative of the St. Louis Shipbuilding and Steel Company (not listed on the program), spoke on the experience of his company.

Labor is entitled to the same courtesy in seeking employment as salesmen.

The company has emphasized a program on the humanitarian angles, believing that individuals can serve in some capacity even if they are somewhat defective physically. In this program, it is emphasized that there should be no encroachment on private practice.

When the prospective employee presents himself for physical examination, he is greeted by a mature receptionist who makes the applicant feel at ease. He is given an appointment for an interview and the receptionist introduces the applicant to the interviewer and takes him to the interviewing room. At first, nothing is said about the work, but eventually it is determined if he is capable of the employment which he seeks. He is told the approximate date of his employment, his application is checked, and he is returned to work, with the selection of a job. Later on, he is examined. If there is rehabilitation necessary, the job is fitted to him in terms of his rehabilitation program. The minimum age of acceptance is 18 and there is no maximum limit, but the physician's judgment in making the examination is the determining factor.

Under the present labor conditions, 20/60 vision is accepted. Blindness in one eye has been accepted for certain jobs. For hearing, 8/20 has been approved. Those having trench mouth, septic sorethroat, and fever, are temporarily excluded. Stiff joints and amputations are accepted for certain types of employment. There is no set blood pressure standard, again relying upon the examiner's judgment. Employment is not denied lung cases without the advantage of x-ray diagnosis. Hernia well supported by a truss is acceptable. For those having varicose veins, again the judgment of the examiner is used.

All applicants receive a blood test and if positive, when the applicant is put under treatment and continues, he is accepted for employment, at the discretion of the examiner. Cooperation with private physicians in this work is very necessary.

Food handlers are examined every month, and everyone has an exit examination at the termination of employment. Vaccination against smallpox is optional.

In each case, after the examination findings have been recorded, if the employee has any restrictions as to his capacity, these are called to the attention of his superintendent.

This program works very well in this organization.

LA VONA BABB ROSS, R.N., spoke on the subject "Industrial Nursing Pays." The experience was detailed in a plant of 600 employees with a physician on call.

The service provides for a pre-placement examination, reference and follow-up; phone calls on injured cases or by request; health education; cooperation with the safety department; sanitary inspections; check on return to work; individual conferences; recommendations for placement on entrance to employment and periodically; nutritional advice; with confidential records on sickness, injuries, and absenteeism.

In this program, the nurse is useful in the following ways: (1) teaching hygiene, nutrition, etc.; (2) early case finding; (3) first aid and care of injuries; (4) assiting in immunization; (5) control of return to work; (6) contacting homes; and (7) assisting in prevention of accidents by reporting observed hazards.

It has been found that the employee morale is greatly helped by a nurse with a sympathetic attitude and one who will maintain confidence in the service.

The nurse is of value to the employer by helping to reduce absenteeism, occupational diseases, and injuries, as mentioned by the National Association of Manufacturers figures. There is also a saving in promoting sanitation, and the speeding of production by helping the workers keep healthy.

Insurance companies approve of industrial nursing because there are (1) careful management of cases; (2) prompt and efficient first aid; (3) proper referral; (4)

Program

Monday

SYMPOSIUM "Industrial Health Work Pays," JOHN BUXELL, presiding:

How Does Health Pay?—W. SCOTT JOHNSON.

Industrial Nursing Pays—LAVONA BABB ROSS, R.N.

Employee Benefits from Industrial Health Work—DR. ELMER RICHMAN.

Making Medical Control in Industry Pay—DR. CHRISTOPHER LEGGO.

Tuesday Morning—First Session

PRESIDING: WILLIAM P. YANT, Chairman: Address of the Chairman.

Symposium on Industrial Hygiene and War:

The Industrial Hygiene Program of the Army Medical Corps—LIEUT.-COL. A. J. LANZA, M.C.

The Program of the United States Navy—CAPT. C. S. STEPHENSON, U.S.N.

The Program of the United States Public Health Service—JAMES G. TOWNSEND, M.D.

Unexpected Occupational Disease Exposures During Wartime—JOHN J. PRENDERGAST, M.D.

Wednesday Morning—Second Session

SYMPOSIUM on Training of Industrial Hygiene Personnel:

The Training of the Physician—CARL M. PETERSON, M.D.

The Training of the Hygienists—DONALD E. CUMMINGS.

Undergraduate Training—MILTON H. KRONENBERG, M.D.

Wednesday—Luncheon Session

ADDRESS E. R. A. MEREWETHER, M.D.

Report of the Committe on Skin Irritants—Chairman, LOUIS SCHWARTZ, M.D.

Report of the Committee on Ventilation and Atmospheric Pollution—Chairman, EMERY R. HAYHURST, M.D.

Report of the Committee on Standard Methods for the Examination of Air—Chairman, EMERY R. HAYHURST, M.D.

Report of the Committee on Lead Poisoning—Chairman, ROBERT A. KEHOE, M.D.

Report of the Committee on Pneumoconiosis—Chairman, R. R. SAYERS, M.D.

Report of the Committee on Industrial Anthrax—Chairman, HENRY FIELD SMYTH, M.D.

Thursday Morning—Third Session

SYMPOSIUM on Chemical and Engineering Methods in Industrial Hygiene:

A Critical Study of the Phenoldisulfonic Acid Method for the Determination of the Oxides of Nitrogen—HELMUTH H. SCHRENK, PH.D.

The Determination of Halogenated Hydrocarbons—FREDERICK H. GOLDMAN, PH.D., and CHARLES G. SEEGMILLER, PH.D.

A Practical Housekeeping Program for Industry—HERBERT G. DYKTOR.

Thursday Afternoon—Fourth Session

THE Acute Toxicity of Vapors of Several Mono-Alkyl Ethers of Ethylene Glycol—HAROLD W. WERNER, PH.D., JAMES L. MITCHELL, JOHN W. MILLER, M.D., and WOLFGANG F. VON OETTINGEN, M.D.

Physiological Response to Inhaled Magnesium Dust—LEROY U. GARDNER, M.D.

Monomeric Styrene—DON D. IRISH, PH.D.

Industrial Eye Health Problems—HEDWIG S. KUHN, M.D.

Friday Morning—Joint Session

PRESIDING: WILLIAM P. YANT and HENRY T. SCOTT, PH.D.

Food and Nutrition of the Industrial Worker in Wartime—FRANK G. BOUDREAU, M.D., and ROBERT S. GOODHART, M.D.

Teaching Nutrition to the Families of Industrial Workers—EVELYN HOLLEN.

The Functions of Nurses in Industry—OLIVE M. WHITLOCK, R.N.

Improved Dental Health for Workers—LYMAN D. HEACOCK, D.D.S.

Conception Control in Industrial Hygiene—EVA DODGE, M.D.

follow-up, stimulating early return to work; (5) follow-up on physical examinations; and (6) cooperation with safety committees.

The nurse's services pay the doctor because of (1) explicitly following orders; (2) follow-up procedures on the physical examinations; (3) the saving of time; (4) case routing; and (5) the frequency and intimacy of contacts, leading to confidence in the service.

Industrial nursing services pay the community because of the many contacts with the various agencies interested in nutrition, venereal disease, tuberculosis, blindness, heart disease, assisting in exploding fallacies, in early case-finding and isolation, and also rehabilitation.

All in all, the nurse's service in industry contributes to the maintenance of the things that go to make up the United States of America, and to the preservation of our many freedoms.

IN THE absence of DR. ELMER RICHMAN, his discussion of "Employee Benefits from Industrial Health Work" was given by DR. H. G. GREDITZER.

A review of the usual statistics on absenteeism was presented. It was stated that a coordinated program pays because it is good business. In this, labor relations are quite important.

The barrier between curative and preventive medicine must be broken down, to obtain good results in industrial health programs.

In union groups, it has been found that $18 per year per person is the cost of the usual type of medical care which can be practicably rendered.

It should be now realized that the problem of industrial health is an emergency at the present time.

Statistics show that three and a half billion dollars a year are expended for medical care; that two and a half million people are sick at one time, and that 10 billion dollars are lost from sickness each year.

To provide for adequate compensation for the medical profession, there should be (1) a prepayment budget; (2) a well organized medical care program; and (3) a profession industrially trained.

DR. CHRISTOPHER LEGGO discussed the subject "Making Medical Control in Industry Pay."

Medical control in industry may be made to pay in dollars and cents; in employee-employer relationships; in higher standards of care; in personal efficiency; and in the war effort.

It is significant that every program must be fitted and altered to the individual industry, as needed.

In reviewing the evolution of the present compensation system, and commenting upon its program in industry, it was stated that the compensation program at present helps everybody, although it has certain defects.

Complete medical care is not regarded at present as the industrial pattern.

Success in any medical control program involves "calling the balls and strikes" as one sees them, without prejudice.

It is essential that the medical control program fit in with the administration of the company; one may compromise policies but never principles.

The program must, moreover, be built on conservatism; one should beware of new devices, drugs, nostrums, and such.

It should be borne in mind that the medical department must keep out of disputes—and recognize conditions as they are and not as what they might be.

The matter of records can be overdone; the confidence of the employee must be retained. Both of these important principles (namely brief records and confidence of employees) can be done at the same time without difficulty.

It is essential that the medical personnel (which includes nurses) must not only know what to do, but also what use to make of what is done; it is of little avail that the results of physical examinations are not put to proper use, and if results of blood testing programs are likewise left unused.

Finally, medical control programs in industry must not only pay, but must last.

COMPLETING the symposium, MR. P. N. BUSHNELL, Director of Industrial Relations of the Missouri Portland Cement Company, St. Louis, spoke on "Evolutionary *vs.* Revolutionary Changes in Industrial Health Work."

Briefly, it was emphasized that the following points are important in the program: (1) proper and adequate care of injuries; (2) rehabilitation of individuals as soon as possible; and (3) proper use of examination records for placement.

It is recognized that the matter of privacy of records is really a problem. This cannot always be settled on the basis of a static policy; a flexible system must be used in order to secure the best results, since there are exceptions to the rule of privacy of records which sometimes create problems which cannot be settled in any other way than by the use of a flexible policy.

Personnel relations managers and employment managers also want to "lean on" the medical profession, but frequently the profession does not desire this to take place, in assuming responsibilities for decisions as to employability.

Finally, it was stated in detailing various experiences in medical control programs as related to personnel administration, that what is needed is better "administrative intelligence" as to records and policies.

Tuesday Morning

MR. W. P. YANT, Chairman of the Section, gave the annual Chairman's Address.

In contemplation, one is greatly impressed with how much there is known and how much there is to work with in industrial hygiene, as compared with how little there was when the section was founded in 1914. We have now passed into offensive tactics. It is fair to say that industrial hygiene is as near ready as it could be expected to be.

The war will probably advance the cause of industrial hygiene at least one to two decades. The influence and the benefits of industrial hygiene work will grow; there are many avenues of expansion.

Workers will take back knowledge of preventive measures into their postwar jobs in the industries where they were formerly located. This may represent the beginning of the important principle of instruction of the individual worker.

More than ever now is there research, and great amounts of money expended in the field of industrial hygiene.

We must continue to render service in manpower and production, neither at the expense of the other. We must continue to prosecute research. Instruction of the individual worker must continue. More nurses can be used. Finally, great impetus will be given to all phases of industrial hygiene work by the war effort.

LIEUT. COL. A. J. LANZA, M.C., began the Symposium on Industrial Hygiene and War in a discussion of the subject "The Industrial Hygiene Program of the Army Medical Corps."

The mechanics of warfare brought industrial hygiene to the army. Hazards of operations, maintenance and repair are involved.

An armored force research laboratory has been established at Fort Knox (especially with reference to tank corps activities) and a wide variety of personnel has been used, concerned with the technical problems of mechanics and communications.

The army now owns more than 160 industrial plants and more than 250 are under construction, including the manufacture of munitions and machines; there are now employed about 600,000 persons.

An occupational hygiene branch of the Army Medical Corps has therefore been established with functions in two main activities: (1) where possible, experienced physicians are assigned to plants—industrial physicians and industrial engineers are assigned to the various service commands; and (2) an industrial hygiene laboratory has been established at Johns Hopkins University at Baltimore.

The occupational hygiene branch of the corps is for-

tunate in having the invaluable aid of the U. S. Public Health Service with its vast experience. The occupational hygiene branch will act as an active liaison with the various service departments.

CAPT. S. C. STEPHENSON, U.S.N., discussed "The Program of the United States Navy."

It has been found necessary to stretch personnel in industry, hence this condition presents certain problems. Temporary "straining" however is not warranted.

The Council on Industrial Health of the A.M.A. has set forth certain objectives of industrial health which were restated.

For years the Navy has had a comprehensive safety program. It is now recognized that efficiency and health cannot be divorced.

A Section on Industrial Health was established in the Navy early in 1941, serving shore establishments, training officers for staffing, and supplying trained engineers and physicians. There is a safety officer for each 1500 employees in the naval industries. The usual pre-employment and check-up examinations for special occupations are done, and also the periodic checking of control measures is carried out.

Analyses of injuries and illness are shown in a statistical report, and these form the basis for changes in the regular program.

The Navy continues to prosecute a positive program in prevention.

DR. JAMES G. TOWNSEND discussed "The Program of the U. S. Public Health Service." Industrial hygiene programs now assume A-1 priority rating.

It has been the practice of the Public Health Service to follow the program outlined by the Subcommittee on Health and Industrial Medicine.

At the present time, there are 38 states, two county, three city and three regional industrial hygiene units, which are supervised by the Public Health Service.

Industry as a whole is probably now employing 15 million war workers, which will probably reach 17.5 million by 1943. During 1942 there were probably two and a half million workers reached in 32 states and in 5000 plants by the activities of the industrial hygiene bureaus.

There are now four mobile units working on various plant surveys and 65 have been completed at the present time. Reciprocal relations have been also established with the OCD in plant defense.

Research is being conducted for the Army and Navy in aviation and munitions plants, and many projects are in work. There is a training course in industrial dermatology. Also there are plans being promulgated to assist consultants in medicine and dentistry in coordinating their services.

Various surveys have been conducted, such as ventilating studies in the use of toxic vapors—study of x-ray methods through the use of mobile units—and there has been assistance rendered in a survey of industrial nurses.

An outline of plant survey records forms has been prepared and distributed. A manual of industrial hygiene and industrial medicine is now being prepared and will be ready in a few months. An annotated bibliography on industrial psychiatry is being prepared, and also an alphabetical list of educational material.

The major problem is lack of adequate community health services in mushrooming industrial areas.

In conclusion, preventive programs are vital in wartime efforts and their extension is very necessary.

AS THE final number in the Symposium on Industrial Hygiene and War, DR. JOHN J. PRENDERGAST discussed the subject "Unexpected Occupational Disease Exposures during Wartime."

Wartime activities in industrial hygiene have served to demonstrate the attitude of industry. In contemplating the prevention of disease, the necessity arises for the investigation of new materials, but keeping up with the old, because of increasing use by uninstructed employees.

Among the substances necessitating investigation because of increased use by uninstructed employees or because of unusual uses, were benzol, carbon tetrachloride, and lead tetraethyl. The latter substance is used in increased amounts now in gasoline and for cleaning purposes, as well as for fuel.

Dermatitis problems have also been encountered in cycle welding, from dyes and resins on canvas tarpaulins—this latter problem has now been solved by changing the filling materials used. Another important dermatitis problem arose because of bronze itch from an alloy of aluminum and magnesium.

A noise problem has been found to give concern in the testing of motors, which has been solved by the acoustical treatment of control chambers. The employees are now given audiometer, electrocardiograph, and basal metabolism tests.

It is important to understand that a great many problems have necessarily arisen because of priority restrictions.

Although industrial hygiene has always been very important, it is now more necessary than ever to observe due precautions for the health protection of industrial workers.

THE discussion which followed this symposium was participated in by DRS. SMYTH and HAYHURST, who gave a historical resumé of industrial hygiene activities, including a reference to spray coating, sandblasting, and carbon tetrachloride studies—the Illinois survey on occupational diseases, and other interesting phases of industrial hygiene developments.

DRS. MCCONNELL, SHEPARD, GRAY and TOWNSEND also participated in the discussion. More confidence should be placed in real preventive measures rather than in treatment. The experience in the California Institute on Industrial Health was cited by DR. SHEPARD. DR. ALBERT GRAY talked about the work, on the east coast, of various industrial hygiene bureaus, stating that the Connecticut Bureau made upward of 5000 blood tests a month on industrial employees; that the industrial physician is really the health officer in the plant. An important announcement was made concerning the fact that Yale University is now working on a program for small industries. DR. MUDD emphasized the control of communicable diseases in industry, and DR. TOWNSEND announced that a statement of policy regarding venereal disease would be issued by the U. S. Public Health Service.

Wednesday Morning

THE Wednesday morning session was a Symposium on Training of Industrial Hygiene Personnel. DR. CARL M. PETERSON opened the symposium by discussing "The Training of the Physician."

A quotation was given from the statements made by the Procurement and Assignment Service as to what an essential physician is in industry. This was discussed with reference to the stabilization of personnel and other recommendations of the Procurement and Assignment Service were quoted.

The State Committees on Industrial Health were mentioned and their functions outlined.

The Council on Industrial Health of the A.M.A. can be of considerable help in establishing training centers for the use of general and special practitioners. This can be accomplished by assisting medical schools all over the country in the establishment of these courses, both for regular medical students and also for post-graduate work in various communities. A three-weeks course, for example, could be based on the outline of the previously published combined report (referring here to the combined report by the Council on Industrial Health of the A.M.A. and the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS). The course at the University of Virginia, at Richmond, was cited as an example of a successful one in a medical school.

Fellowships of $250 a year may be available at a later date through the activities of the A.M.A. Council on Industrial Health.

It is planned to have continuation courses for general and special practitioners at periodic intervals.

Graduate instruction is also being planned, with arrangements being made for residencies and fellowships. These may take the form of six months of industrial toxi-

cology, six months of hospital experience, and six months in an industry. After such instruction, certification might be possible.

County committees on industrial health are now beginning to be set up in various areas, on which there is represented the private practitioner, the industrial practitioner and a health official.

In conclusion, it was emphasized that it is highly important that we capitalize on the widespread interest in industrial health for sound planning and organization.

IN THE discussion of Dr. Peterson's paper, DR. FREDERICK J. WAMPLER emphasized the necessity of interesting insurance men; DR. SARAH I. MORRIS, of Philadelphia, discussed briefly the eight weeks course in the Women's Medical College of Philadelphia, in which the course is scheduled for two hours a day for three days a week, in the late afternoon; and DR. R. R. SAYERS pointed out that it was necessary to teach preventive medicine to all of the groups engaged, including physicians, engineers, chemists, and nurses.

PROF. DONALD E. CUMMINGS discussed "The Training of Hygienists."

There has been a great impetus during the past 10 years on the integrated application of specialized engineering and preventive medicine to industry.

It is obvious that war accentuates hazards, exposures and unhealthful conditions. But in the military services better selection of men is possible and the priority problems are less serious than in private industry.

For purposes of real sound functioning, the hygienists should probably have a personnel pool similar to the medical pool of the Procurement and Assignment Service.

Emergency training courses probably will displace the usual methods and courses of instruction. Instruction should include the education of representatives of industry, and practical demonstrations are vital. History taking is most important. Industrial clinics are essential to the proper demonstration of material and the handling of it. There should be cooperation with other departments of universities and also with state bureaus. This is the opportunity for the instructees to practice technical procedures under supervision.

IN THE discussion of PROF. CUMMINGS' paper, LIEUT. COL. LANZA stated that he thought some of the things proposed by PROF. CUMMINGS would "be spreading the butter pretty thin." It is important for us to realize that one cannot refuse men who want to enlist; in other words, enlistments cannot be controlled. Contrary to PROF. CUMMINGS' opinion, there are greater hazards in war production industries than in civilian production. Engineers should have similar intensive training, as has been arranged for doctors.

DR. WILLIAM G. FREDRICK, in discussing the presentation, emphasized certain points: (1) that courses at the University of Michigan are available for intensive training; (2) that war production plants are modern, but priority ratings frequently balk progress anyway; (3) a working arrangement with the Department of Labor and Industry has been found extremely useful, as this department uses inspectors who represent scouts who find suspected hazards which later can be investigated properly.

In his discussion, DR. HENRY FIELD SMYTH, SR., emphasized the importance of field demonstrations in the teaching of industrial hygiene—the internship will be also be of great value in training.

DR. MILTON H. KRONENBERG completed the presentations in this symposium, speaking on "Undergraduate Training."

Courses are supposedly not to be changed in the regular curricula, but this does not necessarily hold true. Undergraduate work in industrial hygiene must be made available on more frequent and better organized bases.

In reviewing the courses given by medical schools, the following facts were found: in 1928 four schools gave courses; in 1940, 52 schools gave courses averaging five hours, and in 1941, the average of the courses given was over six hours.

The older method of teaching by the division of work, alloting certain portions of industrial hygiene and industrial medicine to different departments has not been productive of the desired results. This means that there must be a regular course and if possible, a regular department as such.

Courses in medical schools must be well organized and a group of lecturers used to get the best effect. There should be a required course in the junior year and an elective course in the senior year. Clinical clerkships should be provided, and an occupational clinic set up for the demonstration of out-patient material. There should be a short intern service in industry if this can be practically arranged, approximately six weeks being desirable.

Finally, it is important to bear in mind that the science of medicine is applicable to industry.

In discussing DR. KRONENBERG'S presentation, DR. ALBERT GRAY mentioned the seminars which are being held at Yale University, involving a one-hour lecture and a two-hour discussion period, with a bibliography being provided. It was also stated that 90-hour courses are now being planned for various areas throughout the country. What is really needed is the development of cooperative effort with industry, the official agencies, physicians, engineers, and others who are in the program.

In closing the discussion, DR. E. R. A. MEREWETHER, of Great Britain, very appropriately mentioned that industrial hygiene, the Cinderella of medicine, is now casting off her rags and becoming respectable.

Wednesday Luncheon

THE regular Industrial Hygiene Section luncheon, including the reports of various committees, was held as usual, this time the guest speaker being DR. E. R. A. MEREWETHER, of Great Britain.

DR. MEREWETHER stated in the beginning that he was no Daniel, but that he has seen a lot of lions.

The Factory Act in Great Britain places certain responsibilities on the personnel of the inspection service, which includes the function of enforcement. The work is arranged cooperatively with the trades unions.

Minimum legal standards are posted in every factory so that they will be well understood. It is well known that the accepted definition of inspection in Great Britain means to look, to inquire, and to aid. A quotation was read from the regulations stating "The inspector functions by persuasion, with sanctions in the background."

At the present time there are 347 inspectors, and these represent the background of the work done through the Ministry of Labor and National Service.

The blackouts probably represent the greatest problem, creating lack of ventilation and other difficulties, which have been much improved lately.

The lesson of working hours has had to be relearned, and there have had to be many readjustments. At present, there is no restriction of activity except for young persons ages 14 to 18 and for women. Rotation is practiced in certain jobs and is quite helpful.

There have been definite changes in the age distribution of the population. The age group 30-50, for instance, involving 50% of the population, and those over 50 involve almost the other 50%. This change of age distribution, which of course has come about gradually, has been one of the great factors in absenteeism.

Many women have been employed under the age of 45, which also increases the problems in industry. There has been a great increase in tuberculosis in all age groups. Lice and scabies represent another problem in sanitation.

There have been some increases in various types of chemical poisonings, for example, poisoning due to nitrous gases has been increased 24 times, but there has been only one death. Carbon monoxide cases are also increased. The figures for toxic jaundice from the period July, 1916-1917 were 308 cases with 79 deaths, whereas the years 1941-42 show only 37 cases and 10 deaths. Dermatitis is up three to four times, and it is important to say here that

this disease is not compulsorily notifiable. Accidental injuries are up considerably, with a greater proportional increase among women.

Orders for various types of services have increased greatly, such as an increase in medical, welfare and nursing, and also in the installation of canteens serving hot low-priced meals.

Nurses have been found to be great morale builders. There are now 30% women inspectors in the service. Women in general have "delivered the goods."

Changes among industrial workers from place to place have been very much restricted, and are now regulated to a considerable extent in that changes can only be made for so-called adequate reasons.

THE regular reports of committees were given by the chairmen of the various committees, as noted in the program, the reports to be published later, but summaries can be given here.

DR. LOUIS SCHWARTZ, chairman of the Committee on Skin Irritants, reported for that committee. Dermatitis is way ahead of other occupational diseases in incidence, constituting about 95% of the occupational diseases reported in war production industries. One of the difficulties encountered is the use of substances formerly used and for a time discontinued, but now being used again by the uninitiated and unsupervised workers. An important principle now is to treat the worker on the job so that he may become desensitized. The rationale of protective ointments and skin cleansers has now been well developed and can be applied by those who need it. It is important that the education of dermatologists and physicians continue with respect to the problems of industrial dermatoses. The committee now has in preparation an abstract of the literature.

DR. EMERY R. HAYHURST, Chairman of the Committee on Ventilation and Atmospheric Pollution, reported very briefly on the work of the committee. An important factor is keeping the wall temperatures higher than the air temperatures during the winter months and vice versa; this principle helps a great deal in maintaining healthy air principles, but other factors must also be considered.

DR. HAYHURST also reported for the Committee on Standard Methods for the Examination of Air, citing the work of Dr. Goldman with reference to chemical procedures for the determination of cadmium and hydrogen sulphide in the air, and also stating that MR. BLOOMFIELD, the Chairman of the Subcommittee on Dust procedures had no additional report to make. The subcommittee on Bacterial Procedures in Air, chairman of which was MR. WILLIAM WELLS, had no report.

DR. ROBERT A. KEHOE, Chairman of the Committee on Lead Poisoning, stated that this committee has brought its work almost to completion during the past year. There is in preparation a bulletin which will deal with various aspects of industrial lead poisoning in a comprehensive manner and bring the discussion and recommendations into line with current knowledge and the best of present practices. The first section of the bulletin had been reported upon at the 1941 meeting; the final report will soon be submitted for publication, possibly before the end of the calendar year of 1942, and will provide 60 or 70 printed pages of discussion, the purposes of which are (1) to outline practical and effective measurements for the recognition and prevention of hazardous lead exposure in industry; (2) to describe satisfactory methods for the differential diagnosis and treatment of lead intoxication; and (3) to clarify the medicolegal aspects of occupational lead exposure and absorption. A classified list of references will be appended.

DR. R. R. SAYERS, Chairman of the Committee on Pneumoconiosis, made a progress report, but stated that there was nothing new to be reported from this committee.

DR. HENRY FIELD SMYTH, briefly commented on the report of the Committee on Industrial Anthrax. Apparently there has been a definite increase in anthrax cases around Philadelphia in textile mills, and this condition should be checked critically to avert the continued increase of anthrax cases in postwar periods.

Thursday Morning

THE Thursday morning session of the Industrial Hygiene Section was a Symposium on Chemical and Engineering Methods in Industrial Hygiene.

DR. H. H. SCHRENK presented the first paper in the symposium, "A Critical Study of the Phenoldisulphonic Acid Method for the Determination of the Oxides of Nitrogen."

In considering the oxides of nitrogen, it was stated that N_2O is not so important, but that NO_2 and N_2O_4 are really the important oxides, from the viewpoint of the industrial toxicologist. Chemical reactions were written on the blackboard showing the evolution of the oxides of nitrogen and their reaction with oxygen and water.

The phenoldisulfonic method has been in use for some time and is really an old method, having been used since 1911 in estimating the nitrates in water analyses. One can estimate either nitrates or nitrites.

In the tests made, a vacuum bottle method was used, the capacity of the bottle being 250 cc. Ammonium sulphate and hydrogen peroxide were added to the oxides and the amount of nitrogen determined as nitrates. It appeared at the outset that the results were inconsistent, there being difficulty with standard brands of nitrogen peroxide as found on the market. In the examination of the bottles, it was also found that there were certain oxides of nitrogen present, apparently formed by the sealing process. It was found possible to use a brand of hydrogen peroxide which gave no positive test and the bottle necks were also washed after sealing, which did away with the other difficulty.

These difficulties having been overcome, tests on known amounts showed the method to be of adequate precision, that it was reliable in ranges from five to 500 parts per million. Field samples confirmed these laboratory tests in which colorimeters were used.

With regard to hydrogen peroxide, it was found that approximately one-third of a fresh bottle of the peroxide was good for one year, which takes care of the usual concentrations of the oxides of nitrogen in the air.

Another important point was the necessity for the careful preparation of phenoldisulphonic acid. When the acid works as it should, the color reaction develops immediately, yellow being the positive reaction, with green shades showing a questionable reaction as to the valid properties of the acid.

DR. FREDERICK H. GOLDMAN discussed the subject "The Determination of Halogenated Hydrocarbons."

The usual method of determination is by the use of a hot absorption tube with platinum as a catalyst and the analysis of the end products. The amyl acetate method has also been used, but its validity has been questioned. In this series of tests, carbon tetrachloride was used in the evaluation methods. A special apparatus was devised (illustrations of which were demonstrated by lantern slides) and employed for the testing apparatus, taking as an example, carbon tetrachloride.

Both the Dudley and the Willson types of apparatus were compared in these tests, the chlorine being determined as silver chloride gravimetrically. The same results were obtained with concentrated and dilute solutions of sodium carbonate, and also the same results were obtained for both the Dudley and Willson solutions.

It was apparent that the Willson apparatus functions well in low concentrations and the Dudley apparatus in high concentrations.

Good results were also obtained with a volumetric method.

The sampling rate was one liter per minute for a period of 30 minutes. Two bubblers were found necessary, the first taking approximately two-thirds and the second, one-third of the sampled material. It was also found possible to devise a simpler apparatus for the purpose of collecting samples.

DR. WILLIAM R. FREDRICK discussed "The Collection, Determination, and Identification of Solvent Vapors."

It was proposed in this review of methods to consider only the commonest ones and also compare new methods

with present ideas. There are certain problems in painting and spray coating especially to be considered and also in the collection of petroleum derivatives which are mixtures and not really pure.

One may group vapors into those which are burnable and those which are non-burnable.

Specific methods are not common.

The interferometer is naturally restricted to the sampling of one vapor, although others can be eliminated sometimes. It is of interest to know that an American company is now working on the commercial production of an instrument which can be marketed for less than the foreign makes and also can be calibrated more easily, as well as checked more conveniently.

The combustible gas indicator is valuable in ranges of 100 to 250 parts per million. This instrument must be calibrated against specific vapors. The formula for the flammability of mixtures is useful here.

Only two chemical methods are in general use and these are colormetric methods for the estimation of benzol and toluol. There are certain objections to the Willson apparatus (1) the furnace burns out and has to be redesigned; (2) the absorption tube permits leaks of vapors and also must be redesigned.

It is valuable to use the sense of smell for the identification of the various mixtures of vapors; obviously the sense of smell must be cultivated and educated.

It has been found useful to examine solvent mixtures, asking the manufacturer about the formulae of them, and analyzing them by fractional distillation, as well as by other methods, although there are lots of difficulties encountered and the procedures are very time-consuming.

Identification also may be made by the boiling point, the index of refraction (use fractional distillation samples), and specific gravity is also useful.

The dropping mercury electrode appears to be promising. Instruments absorbing ultra-violet and infra-red rays have been devised, but not extensively developed.

MR. HERBERT G. DYKTOR presented the final paper on this symposium entitled "A Practical Housekeeping Program for Industry."

It should be pointed out in the beginning that housekeeping means more than order and cleanliness—it actually goes over into the field of sanitation and includes: (1) placement of men and machines; (2) provisions that there be no health hazards in the operations; (3) an easy flow of operations; (4) proper storage of materials; (5) provision for pure water supply and proper sewage disposal; (6) provision for adequate janitor service; and (7) provision for proper maintenance.

Housekeeping forms the basis of all hygiene and sanitation programs which should be found in all plants. Management must be sold on these programs by the industrial hygienist. This means contacting the safety engineer in the large plants and the employment manager in the small groups. Periodic inspections should be made with superintendents and agreements reached for the establishment of general policies; consultations should be held with the Health and Labor Departments as to working out of techniques and administrative principles.

In summary, it is concluded that a practical housekeeping program for industry is essential to efficiency of production.

Thursday Afternoon

DR. HAROLD W. WERNER discussed "The Acute Toxicity of Vapors of Several Mono-Alkyl Ethers of Ethylene Glycol."

In these studies "Cellosolve" and related compounds, such as methyl ether, butyl cellosolve, also N-propyl and isopropyl compounds were investigated and acute toxic effects observed in experimental animals, which were mice in this series of investigations.

Lantern slide demonstrations were given of the types of apparatus used.

The investigation showed that severe dyspnea is characteristic and that there is also marked hemoglobinuria. The most frequent pathological changes were observed in the spleen.

The compounds are toxic in the following order: methyl, ethyl, isopropyl, N-propyl, and butyl. The volatility is decidedly important in this connection.

In concluding, it was emphasized that these results are based only upon acute effects as observed in mice.

DR. LEROY U. GARDNER discussed "Physiological Response to Inhaled Magnesium Dust."

There are few employees subjected to the inhalation of magnesium dust because of the fire and explosion hazard involved.

Particle sizes in this investigation ranged from 1 to 100 microns, the majority being from 30 to 40 microns, with an appreciable amount under 4 microns.

Guinea pigs and cats were used as experimental animals and injections were made into the lungs and the groins. Gas bubbles were observed under the skin during the first 24 to 72 hours and then they disappeared.

In the lungs, the reaction was a subacute pneumonia which disappeared in approximately four weeks. Lantern slides of pathological sections showed collection of phagocytes in the air sac walls and also vacuoles and vacuolated cells which disappear after four weeks.

It was concluded on the basis of this investigation that there is no real practical problem in the inhalation of magnesium dust and that there is nothing of hygienic importance in this problem.

DR. DON D. IRISH discussed "Monomeric Styrene."

This compound is a simple aromatic hydrocarbon with a vapor pressure of 4.3 milligrams of mercury at 15° C. It is a clear liquid and is used for pump housing.

Experimental evidence in rats showed that at an exposure of 10,000 parts per million the rats survived in one hour but succumbed after three hours; at 2500 parts per million, the concentration can be tolerated for two hours; at 1000 parts per million, the concentration is allowable for 30 hours.

As to pathological effects, a secondary effect was observed on the liver and kidney tissue, the primary one being irritation of the lungs.

As to metabolism, the material is excreted as benzoic acid and oxidized to hippuric acid.

In summary, the primary effect of monomeric styrene is lung irritation. As to concentration, 650 parts per million are tolerated well for long periods of time, but are fairly irritating. However, the vapor possesses good warning powers on account of the odor. At 400 parts per million the odor is noticeable but tolerable, and this seems to be a good level of permissible concentration.

DR. HEDWIG S. KUHN completed the Thursday afternoon session with the paper "Industrial Eye Health Problems."

The two main problems are (1) need for a revision of visual standards, considering training, the job, and vision; and (2) a survey of employees in certain industries for the purpose of increasing visual ability in terms of efficiency on the job.

Eye protection is now universally practicable in all phases of industry and job relationships.

Three forms of examination are in use, employment examinations, periodic examinations, and survey examinations. It is desirable that these examinations include the measurement of distant and near vision with and without glasses; muscle balance; color appreciation levels; and the study of depth perception in near vision.

Job specifications must be worked out and take into consideration many factors. We must validate technique from the point of view of occupational needs, and at the present time there is in process a study of varying types of correlations.

The lantern slide demonstration showed statistics on various types of occupations.

DR. LEONARD GREENBURG, in discussing DR. KUHN'S presentation, brought out the following points: (1) we need employment examinations of a better type; (2) there must be more examinations for all types of employees; (3) there must be better illumination; (4) there must be a bigger and better campaign on the prevention of eye injuries; and

(5) there must be a wide educational campaign on the conservation of vision in industry.

Friday Morning

THE final session of the Industrial Hygiene Section was a combined meeting with the Food and Nutrition Section.

DR. FRANK G. BOUDREAU spoke on "Food and Nutrition of the Industrial Worker in Wartime."

A great deal of the material in this report has been previously published in the various reports of the Council on Foods of the American Medical Association and the Committee on Industrial Nutrition of the National Research Council.

It is apparent that we in this country are not doing as well on the subject of nutrition as Germany did at the beginning of the war. The British also have set us a good example in the installation of canteens in industry.

Sample surveys have been made on small and large groups by our various nutritional committees and have showed extensive food deficiency. A survey of 33 war plants showed the usual recent findings, such as 55% deficiency in green vegetables and some considerable deficiency in the use of milk and fruit.

A general survey of the whole nutritional situation in industry was given in general terms.

EVELYN HOLLEN discussed "Teaching Nutrition to the Families of Industrial Workers."

This report was essentially an outline of the work of the State Department of Health of Iowa. In the beginning, a leaflet on better dinner pails was printed and distributed to plant managers, followed by a leaflet on between-meal snacks. Also there was published a survey outline for the use of nurses in industry and some surveys of cafeterias, referring particularly to the eating habits of the patrons, were done.

Information has also been carried to the homemaker by conferences and demonstrations for them. Labor unions have been contacted and demonstrations and meetings have been held. Seven lessons have been prepared on the selection and preparation of foods for distribution to homemakers.

OLIVE M. WHITLOCK, R. N., spoke on the subject "The Functions of Nurses in Industry."

The object of the U. S. Public Health Service survey regarding industrial nurses was to provide factual data with respect to nursing practices in industry.

Thus far there have been completed schedules on 716 establishments, involving two million workers, and in which 2270 nurses and 500 other nursing workers were engaged.

In this survey, 34 states and the District of Columbia were involved. As to industries, the iron, aircraft, and machine tool industries have in 80% of instances employed nurses.

As to size of industry surveyed, 19% had under 500 employees; 55% had 500 to 2500 employees; and 23% had over 2500 employees. It was also found that 42% of these industrial groups had physicians on call.

As of 1941 there were approximately 6000 industrial nurses in this country, 70% of the 1900 full-time nurses having begun work in 1940-41.

The nurse in this survey has been found to do various types of service, such as taking histories; measuring vision and hearing; taking height and weight; temperatures, pulse and respiration; taking care of laboratory specimens; making house calls; and referring cases to outside physicians.

The survey disclosed that there is an opportunity in health education—only about 40% of the industries surveyed show programs of this sort.

As to safety work, 40% of the industries showed nurses as members of safety committees.

With regard to nutrition, 35% used nurses for inspection of cafeterias and 20% for advice on nutrition problems.

In 35% of the groups surveyed, the industrial nurse has clerical help for the keeping of records.

Among miscellaneous activities interestingly encountered in this survey, that are carried out by nurses, were the following: selling bonds; dispensing telephone slugs; operating telephone switchboards; assisting in secretarial work in other departments; assisting in personnel work; and doing finger-printing.

The foregoing represents a partial analysis of the data on the industrial nursing survey which is still in progress. The final report will be rendered some time during 1943 through the U. S. Public Health Service.

DR. LYMAN D. HEACOCK discussed "Improved Dental Health for Workers." In the beginning of the discussion, comments were made on lost time in industry and the control of the factors causing lost time.

The need for dental care is universal—only about one in 10 industrial plants employing workers provide any type of dental attention.

The American Dental Association has set up minimum standards and outlined services. Emphasis must now be placed on services reducing time lost and inefficiency. This involves complete dental care but emergency methods are necessary to carry out these plans efficiently. The following objectives are important: (1) provision for pre-employment and periodic examinations, (dental); and (2) provision for emergency services which include a variety of practices.

In small plants the following types of plans have been encountered: (1) several small plants have employed the full time of one man; (2) individual plants have employed the part time of an individual dentist; (3) the plant has supplied space for a private practitioner; (4) a group of plants have combined to supply a diagnostic service; (5) a mobile dental service has been provided.

The State Department of Health in most states can usually supply advice on industrial dental problems through its Dental Division.

Health education is a very important component of industrial dental services. Raising the health levels will help raise production; in this program dentistry has been frequently overlooked or neglected; good oral hygiene should be a part of an industrial health program. In this organized program, public health and dental organizations and industries schould cooperate.

THE final paper on the Industrial Hygiene Section program was given by DR. EVA DODGE on the subject "The Problem of Child Spacing in Industrial Health Programs."

Comment was made in the beginning concerning the four and a half million women presenting a problem in industry.

Maternal care can be divided into premarital care; preconception care; prenatal care; delivery care; postnatal care; and child spacing.

Frequent pregnancy and the phenomenon of fatigue in industry, combined with home duties, make special problems among women in industry. There should, therefore, be a provision for a child-spacing program for women in industry.

In 1941 the abortion rate among women workers was 22.5 per 1000 women—this will probably rise in the future on account of the difficult problems as previously indicated.

Proper information as to child spacing should be supplied in a health program in industry.

In conclusion, it was proposed that a consulting service be provided through the industrial hygiene department, which can be of great help in avoiding high mortality and consequent disability with reference to maternal problems among women industrial workers.

TARBONIS CREAM, which is a formula developed at Johns-Hopkins Hospital for the use of the pediatric and dermatological departments in the treatment of eczema and other forms of dermatitis, has been found to be effective both as a treatment and preventive of the very prevalent oil dermatitis and has recently been made available for that purpose. It is manufactured by DONALD MERRILL & COMPANY and is distributed on a national scale by TARBONIS COMPANY, 1220 Huron Road, Cleveland, Ohio.

American Industrial Hygiene Association

—News of Local Sections—

THE local sections of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION are organizing their meetings for 1943, with emphasis on the various phases of industrial hygiene as applied to the war effort and the production of materials used in the war industries. The New England, Pittsburgh, and St. Louis Sections have not yet scheduled their first meeting, but those interested in industrial hygiene in the respective areas should request that their names be placed on the mailing list for announcements. For the New England Section, MR. LESLIE SILVERMAN, 55 Shattuck Street, Boston, Massachusetts; for the Pittsburgh Section, DR. H. H. SCHRENK, U. S. Bureau of Mines Experiment Station, Pittsburgh; and for the St. Louis Section, MR. JOHN BUXELL, St. Louis Department of Health, Division of Industrial Hygiene, St. Louis, should be contacted.

Metropolitan New York

THE first meeting of the Metropolitan New York Section was held on October 14, 1942, at which an open round-table discussion of present and future activities of the Local Section was featured.

The second meeting, November 18, introduced DR. MORRIS B. JACOBS, Senior Chemist and member of the Fumigant Board, Department of Health, New York City, who led a discussion of chemical warfare agents and their classifications, physical effects, chemical identifications, and decontaminations. The lung irritants, vesicants, lacrimators, irritant smokes, screening smokes, and incendiaries were discussed.

The present officers of the Metropolitan New York Section are: Chairman, DR. LEONARD GOLDWATER; Vice-Chairman, ROY S. BONSIB; Secretary-Treasurer, WILLIAM J. BURKE; Councilor, two-year Term, DR. A. G. CRANCH; and Councilor, one-year Term, F. A. PATTY.

Michigan

THE Michigan Industrial Hygiene Society is planning six meetings for the current year. Five will be held in Detroit; one in Lansing. The Lansing meeting, in February, 1943, will be devoted to "Industrial Nursing" and "Women in Industry." In Detroit one session is planned on "Industrial Ventilation," featuring a prominent authority in the field, along with contributions by representatives of local industry. Another session will present "Aviation Medicine," by a Michigan physician who has interesting and valuable material for both medical and non-medical members of the Society. DR. LEROY U. GARDNER, of Saranac Laboratory, and MR. WILLIAM P. YANT, of Mine Safety Appliances Co., have accepted invitations to present their latest information at two of the 1943 meetings.

The officers of the Michigan Section for the 1942-43 year are as follows: President: STUART F. MEEK, M.D., Chrysler Corporation, Detroit; President-Elect: H. G. DYKTOR, Michigan Department of Health, Lansing; Past-President: WILLIAM R. BRADLEY, Department of Health, Detroit; Secretary-Treasurer: WILLIAM N. WITHERIDGE, Department of Health, Detroit.

The Executive Committee includes: MARY ALTON, R.N., Michigan Department of Health, Lansing; A. L. BROOKS, M.D., Fisher Body Division, General Motors Corporation, Detroit; GORDON C. HARROLD, PH.D., Chrysler Corporation, Detroit; T. F. MOONEY, Ford Motor Company, Dearborn; A. O. THALACKER, Detroit Rex Products Company, Detroit.

Chicago Section

THE first meeting of the Chicago Section, held on October 1, 1942, was on the subject "Maintenance of Industrial Hygiene Standards Under War Conditions." Four phases of this problem and what is being done about it were presented by men who are actively engaged in this endeavor. Management aspects of the problem were discussed by A. G. Hewitt, Plant Superintendent, Visking Corporation, Chicago; industrial medical aspects by LAWRENCE G. GOULD, M.D., Medical Director, Buick Motor Division, General Motors, Melrose Park, Illinois; engineering problems by WILLIAM B. LEA, PH.D., Industrial Hygiene Engineer, Division of Industrial Hygiene, Wisconsin State Department of Health, Madison; and the problems of the equipment suppliers C. A. SNYDER, Engineer Dust Control Division, American Foundry Equipment Company, Mishawaka, Indiana.

The second meeting, on the control of lead exposures under difficulties of war production, was held November 5. L. V. TAYLOR, Research Department, American Can Company, Maywood, discussed increased lead exposures due to war conditions; DR. FREDERICK W. SLOBE, speaking on the detection of excessive exposure to lead, outlined urine and blood tests and other means of determination where workers are subject to a real hazard; WARREN A. COOK, Director, Division of Industrial Hygiene and Engineering Research, Zurich Insurance Companies, presented new data on lead exposures in spray painting operations; S. M. TRUMBO, Buffalo Forge Company, Chicago, detailed the application of exhaust ventilation and control of lead dusts and fumes; and JOHN B. LITTLEFIELD, Medical Department, American Brake Shoe & Foundry Company, spoke on present practices in the control of existing lead exposures.

The subject of the third meeting on December 17 was organic solvents in present use. D. D. RUBEK, PH.D., Director, Chicago Research Division, Anderson-Prichard Oil Corporation, Chicago, discussed organic solvents being used in industry today, together with applications to which solvents, thinners and mixtures of them have been adapted. In presenting this subject, with which nearly every industrial plant is concerned these days, DR. RUBEK pointed out the manner in which mixtures of some of the less toxic solvents and thinners can be used in place of certain of the more toxic, and indicated precautionary measures which may be necessary where process requirements stipulate the utilization of some of the more toxic of these substances. Having for many years directed the activities of an able research staff in the development of applications of solvents to industrial operations, DR. RUBEK is in a most strategic position to convey information concerning these materials.

The officers of the Chicago Section for the 1942-43 year are as follows: Chairman: JAMES R. ALLAN, International Harvester Company; Vice-Chairman: JOSEPH H. CHIVERS, M.D., Crane Co.; Secretary-Treasurer: WARREN A. COOK, Zurich Insurance.

The Executive Committee includes: For three years, CLARK D. BRIDGES, Casualty Mutual Insurance Company; A. G. KAMMER, M.D., Inland Steel Company; E. G. MEITER, PH.D., Employers Mutual Liab. Ins. Co.; and ROY M. MOFFITT, Roy M. Moffitt & Company; for two years, HARVEY HENSEL, Youngstown Sheet & Tube Company; J. B. LITTLEFIELD, American Brake Shoe & Foundry Co.; T. O. MEISNER, American Can Company; and C. O. SAPPINGTON, M.D., Industrial Hygiene Consultant; and for one year EARNEST DOWNING, National Safety Council; MILTON H. KRONENBERG, M.D., Illinois State Department of Public Health; CARL LARSON, American Air Filter Company; and LESLIE STOKES, Illinois State Department of Labor.

THE *Brooklyn (New York) Eagle*, December 23: "A new occupational disease, brought on by contact with chemicals used in the fireproofing and waterproofing of cable lines, has caused the deaths of two employees of Anaconda Wire & Cable Company (Hastings-on-Hudson) and one employee of Habirshaw Cable & Wire Corporation, of Yonkers, according to DR. WILLIAM A. HOLLA, Westchester County health commissioner. Four other employees of the two companies have been stricken with the most violent form of the disease, which is usually fatal, while some 500 have been affected in a milder form. DR. HOLLA said that precautions taken at the two plants since health authorities were notified of the outbreak about six weeks ago, have apparently stopped it from spreading, so that no new cases were reported in the past two weeks. In the fatal cases death was caused by a disease of the liver, apparently induced by bodily contact with a hydrocarbon of high chlorine content."

vents
ether
ents,
have
sub-
ndus-
days,
er in
less
n be
more
nary
ssary
ulate
more
aving
vities
e de-
vents
EK is
onvey
ma-

ection
lows:
erna-
Vice-
M.D.,
urer:
rance.
udes:
IDGES,
pany;
Com-
loyers
OY M.
pany;
ENSEL,
pany;
Brake
ISNER,
C. O.
ygiene
RNEST
ouncil;
llinois
Health;
Filter
llinois

Eagle,
ccupa-
con-
e fire-
cable
of two
ire &
-Hud-
e of
Cor-
ording
West-
sioner.
e two
n with
e dis-
while
l in a
d that
plants
e noti-
weeks
it from
cases
weeks.
caused
arently
with a
ontent."